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# Cardiology in Poland — a European perspective

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## THE BEGINNING

The Polish Cardiac Society (PCS) was founded in February 1954, just a few years after the initiation of the European Society of Cardiology (ESC) on September 2, 1950. The first president of the PCS was between 1954 and 1961 Jerzy Jakubowski (Fig. 1A), although before hand a Working Group of Cardiology of the Polish Society of Internal Medicine existed with Mściwój Semerau-Siemianowski, president (Fig. 1B). Mściwój Semerau-Siemianowski together with Izabela Krzemińska-Ławkowiczowa pioneered cardiac catheterisation in Poland as early as 1948. Since 1954 Jerzy Jakubowski, was followed by 14 other eminent Polish cardiologists as presidents of the PCS (Table 1).

Soon local chapters of the PCS were initiated in Gdańsk, Łódź, Poznań and Wrocław (1964), Katowice and Kraków (1965), Warsaw (1970), Lublin (1972), Białystok (1975), Szczecin (1975), Zabrze (1979, formally 1992), Toruń (1991), Bydgoszcz (1992). With increasing activities of the PCS, its membership grew from 550 in 1966 to 705 in 1970 to currently more than 6,000 members and 21 Working Groups.

## THE PIONEERS

Polish cardiologists contributed early on to modern cardiology. For instance, Michael Mirowski (1924–1990) (Fig. 1C) made it to the National Inventors Hall of Fame for co-inventing with Morton Mower the automatic implantable-cardioverter defibrillator (ICD) in the 1960s after his mentor had died of a cardiac arrhythmia (patent number 4,202,340) [1]. Mirowski was born in Warsaw. During the 2<sup>nd</sup> World War, his father renamed him as Mieczysław Mirowski to protect him from the German Nazi regime. By 1944 he was an officer in a Polish regiment, returned to Poland and registered as a medical student at the University of Gdańsk. Graduating in 1954, he sought training in Israel before moving to the Sinai Hospital in Baltimore, Maryland, USA where he worked with Morton Mower and later Stephen Heilman's artificial pacemaker company to develop the first ICD. On February 4, 1980, the first patient received an ICD at the Johns Hopkins Hospital, Baltimore, USA.

Another milestone of Polish cardiology was the construction of a prototype of an intravascular and intracardiac ultrasound by the surgeon and physicist Tadeusz Cieszyński

in the 1960s [2]. His reports were published long before later technical developments allowed for its use in clinical practice [2]. During the 50<sup>th</sup> anniversary of the ESC, Tadeusz Cieszyński represented inventors from Poland at the poster exhibition.

On November 5, 1985, Zbigniew Religa (1938–2009) (Fig. 1D) performed the first successful heart transplantation at the Silesian Center for Heart Diseases in Zabrze. He was a prominent cardiac surgeon, scientist and politician. In 1964, he had completed his medical studies. After graduating and military service he joined the Wolski Hospital in Warsaw where he trained in surgery. In the 70s he held internships in the field of vascular surgery and cardiac surgery in the Mercy Hospital in New York and the Sinai Hospital in Detroit. Upon his return to Poland, he worked at the Institute of Cardiology in Warsaw to later become the director of the Department of Cardiac Surgery in Zabrze where he performed his seminal operation.

## TOWARDS THE POLISH ARTIFICIAL HEART

Zbigniew Religa remained a pioneer of Polish cardiac surgery, performing for the first time in Poland heart and lung trans-

Table 1. Presidents of the Polish Cardiac Society

Names	Years
J. Jakubowski	1954–1961
E. Żera	1962–1972
Z. Askanas	1972–1973
J. Kwoczyński	1973–1979
W. Januszewicz	1980–1986
K. Jasiński	1986–1989
L. Ceremużyński	1989–1995
M. Tendera	1995–1998
W. Rużyłło	1998–2001
A. Cieślński	2001–2004
A. Torbicki	2004–2007
A. Rynkiewicz	2007–2009
W. Banasiak	2009–2011
J. Stępińska	2011–2013
Z. Kalarus	2013–2015

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**Figure 1.** Pioneers of Polish cardiology: Jerzy Jakubowski, the first president of the Polish Cardiac Society between 1954–1961 (A); Mściwój Semerau-Siemianowski, initiator of Working Group of Cardiology of the Polish Society of Internal Medicine in 1950 (B); Michael Mirowski (1924–1990) (C) co-inventor with Morton Mower of the automatic implantable cardioverter-defibrillator; Zbigniew Religa (1938–2009) (D), who performed the first successful heart transplantation in Poland in 1985

plant in 1986. Further, he initiated the Foundation of Cardiac Surgery Development chairing the Foundation Committee and the Artificial Heart Institute. The foundation's mission is to support cardiac surgery in Poland through ongoing research in the field of biocybernetics, modern biotechnology and the development of novel valve and heart prosthesis. To that end he created the Artificial Heart Laboratory through a successful multidisciplinary collaboration and international cooperation with scientific institutions in the field of material technologies, nanotechnologies and bioengineering. These efforts led to the development of several cardiac devices, i.e. the extracorporeal ventricular assist device POLVAD-MEV with the in-hospital driving unit POLPDU-401, the pneumatic total heart prosthesis POLTAH, a prototype of implantable electro-hydraulic prosthesis for left ventricle assistance POLHIVAD, a model of implantable heart prosthesis, built of an elastic titanium nitride nanolayer on biocompatible polymer combined with the portable driving unit POLPDU-501. Notably, some of them were successfully implemented into clinical practice, others used for experimental research. At the end of his scientific career, Zbigniew Religa became a Minister of Health of Poland.

On December 13<sup>th</sup> 2013, the “Polish Artificial Heart”, a project supported by the Ministry of Health and initiated by Zbigniew Religa, had been presented. The “Religa Heart EXT” passed the first phase of experimental studies at the Warsaw Institute of Cardiology. The Ethics Committee approved the launch of the second phase. The Polish artificial heart remains a ray of hope particularly for patients who cannot be transplanted.

### INTERVENTIONAL CARDIOLOGY

Witold Rużyłło is the father of interventional cardiology in Poland. He performed the first percutaneous coronary intervention (PCI) in 1981, four years after Andreas Grüntzig's seminal first coronary angioplasty in Zürich, Switzerland

[3]. During his career he connected Polish cardiology with Europe by serving for several terms on the Board of both the PCS and ESC.

Through his efforts evidence-based practice in PCI was implemented rapidly in Poland. The number of catheterisation laboratories increased dramatically, mostly over the last decade, to currently 216,000 coronary angiographies and 119,000 PCIs annually. Notably, of 153 centres performing PCI, 143 currently provide a 24/7 service for primary PCI. Further, 141 cardiology centres perform electrophysiological procedures for arrhythmias.

### THE POLISH SOCIETY OF CARDIOLOGY TODAY

From its initiation the PCS had a great influence on cardiology practice in the country. Currently, the PCS is among 6 largest national societies of the ESC. One of the key activities of the PCS in Poland was “PCS on the road” whereby in several cities annual international conferences were hosted with over 4,000 delegates each year. Due to the growth of its congress, only 2 Polish centers, i.e. Poznań and Wrocław, are at the moment able to accommodate this event. The annual meetings of PCS had a huge impact on the implementation of evidence-based medicine, structured training along European recommendations and in turn on improved patients care.

One of the features developed during the PCS presidency of Janina Stępińska was a Multimedia Educational Platform available on the website of PCS. Over the last 2 years, the platform was used by more than 1,500 physicians who participated in e-learning educational courses comprising over 30 comprehensive lectures by over 100 Polish experts. The courses of the platform are obligatory for fellows in cardiology training.

Most recently, the PCS focused on primary prevention, intensive cardiac care using also e-learning platforms. Indeed, as Poland is experiencing cardiovascular diseases on an epi-

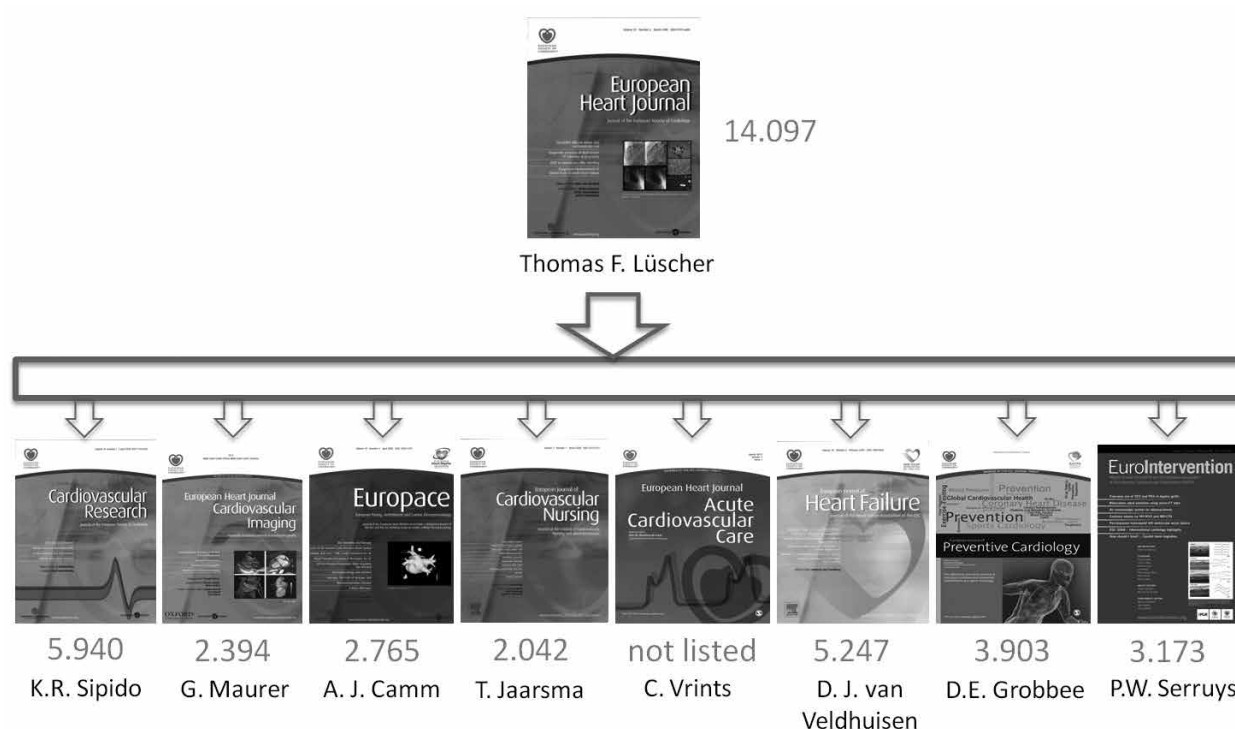


Figure 2. The ESC journal family with their according impact factors and editors

Table 2. Most cited cardiologists

Names	H-index*
Ponikowski Piotr	59
Budaj Andrzej	55
Tendera Michał	51
Torbicki Adam	43
Rużyłto Witold	41
Dudek Dariusz	39
Narkiewicz Krzysztof	37

\*Based on SCOPUS Database, 13.12.2013

mic level, the POLSCREEN program was established to assess cholesterol levels in 1 million outpatients and to implement educational programs on secondary prevention. Finally, the POLKARD 2003–2005 program with its scientific advisory board led by Grzegorz Opolski had been started as a response of the Ministry of Health to financially support of modern treatment strategies of cardiovascular diseases.

#### POLISH CARDIOLOGISTS AND THE EUROPEAN SOCIETY OF CARDIOLOGY

Despite of their political isolation within Eastern Europe after the war, Polish cardiologists could overcome such barriers through international contacts in Western Europe or United States. Nowadays cardiologists from Poland are actively in-

involved in major national and international educational and research initiatives, including ESC Task Forces and the ESC Guidelines Committee. Some of them have played a key role within the ESC, notably Michał Tendera who has served as a board member in several positions and finally as President in 2004–2006. Further, Adam Torbicki, who presided the PCS from 2004–2007, served as Vice-President of the ESC in 2010–2012. Several Polish cardiologists are highly recognised internationally and very well cited (Table 2).

#### THE “EUROPEAN HEART JOURNAL” (EHJ)

The “European Heart Journal” (EHJ) was launched in 1980 and has grown impressively with the ever higher impact factor peaking at 14.1 recently. As a consequence of increased submissions, the acceptance rate has dropped to 11%. In 2009, the new editorial team of the EHJ established the ESC journal family, currently involving 9 subspecialty journals (Fig. 2). In order to work together efficiently, the editors of all specialty journals were invited to become senior consulting editors of the EHJ and a novel manuscript transfer system was established.

#### POLISH CARDIOLOGY AND THE EHJ

Over the last 5 years, 246 papers were submitted by Polish cardiologists to the EHJ with an acceptance rate of 14%. Of note, the best cited papers submitted to EHJ were authored by Michał Tendera and Adam Torbicki. The original research article “Intracoronary infusion of bone marrow-derived selected

**Table 3.** Ten best cited papers of “European Heart Journal” — Poland

Authors	Title	Cites*	Cites**	Year
<b>Tendera M, Wojakowski W, Ruzyllo W, Chojnowska L, Kepka C, Tracz W, Musialek P, Piwowarska W, Nessler J, Buszman P, Grajek S, Breborowicz P, Majka M, Ratajczak MZ</b> [4]	Intracoronary infusion of bone marrow-derived selected CD34(+)CXCR(+) cells and non-selected mononuclear cells in patients with acute STEMI and reduced left ventricular ejection fraction: results of randomised, multicentre Myocardial Regeneration by Intracoronary Infusion of Selected Population of Stem Cells in Acute Myocardial Infarction (REGEN) trial	148	201	2009
<b>Torbicki A</b> , Perrier A, Konstantinides S, Agnelli G, Galie N, <b>Pruszczyk P</b> , Bengel F, Brady AJ, Ferreira D, Janssens U, Klepetko W, Mayer E, Remy-Jardin M, Bassand JP [5]	Guidelines on the diagnosis and management of acute pulmonary embolism: the Task Force for the diagnosis and management of acute pulmonary embolism of the European Society of Cardiology (ESC)	580	903	2008
Ronco C, McCullough P, Anker SD, Anand I, Aspromonte N, Bagshaw SM, Bellomo R, Berl T, Bobek I, Cruz DN, Daliento L, Davenport A, Haapio M, Hillege H, House AA, Katz N, Maisel A, Mankad S, Zanco P, Mebazaa A, Palazzuoli A, Ronco F, Shaw A, Sheinfeld G, Soni S, Vescovo G, Zamperetti N, <b>Ponikowski P</b> [6]	Cardio-renal syndromes: report from the consensus conference of the Acute Dialysis Quality Initiative	112	175	2010
<b>Tendera M</b> , Aboyans V, Bartelink ML, Baumgartner I, Clement D, Collet JP, Cremonesi A, De Carlo M, Erbel R, Fowkes FG, Heras M, Kownator S, Minar E, Ostergren J, Poldermans D, Rimbaut V, Roffi M, Rother J, Sievert H, van Sambeek M, Zeller T [7]	ESC Guidelines on the diagnosis and treatment of peripheral artery diseases: document covering atherosclerotic disease of extracranial carotid and vertebral, mesenteric, renal, upper and lower extremity arteries: the Task Force on the diagnosis and treatment of peripheral artery diseases of the European Society of Cardiology (ESC)	93	163	2011
De Luca G, <b>Dudek D</b> , Sardella G, Marino P, Chevalier B, Zijlstra F [8]	Adjunctive manual thrombectomy improves myocardial perfusion and mortality in patients undergoing primary percutaneous coronary intervention for ST-elevation myocardial infarction: a metaanalysis of randomized trials	86	136	2008
Tardif JC, <b>Ponikowski P</b> , Kahan T [9]	Efficacy of the i(f) current inhibitor ivabradine in patients with chronic stable angina receiving beta-blocker therapy: a 4-month, randomized, placebo-controlled trial	85	129	2009
<b>Kulickowski W, Witkowski A, Polonski L, Watala C, Filipiak K, Budaj A, Golanski J, Sitkiewicz D, Pregowski J, Gorski J, Zembala M, Opolski G</b> , Huber K, Arnesen H, Kristensen SD, De Caterina R [10]	Interindividual variability in the response to oral antiplatelet drugs: a position paper of the Working Group on antiplatelet drugs resistance appointment by the Section of Cardiovascular Interventions of the Polish Cardiac Society, endorsed by the Working Group on thrombosis of the European Society of Cardiology	84	105	2009
Burzotta F, De Vita M, Gu YL, Isshiki T, Lefevre T, Kaltoft A, <b>Dudek D</b> , Sardella G, Orrego PS, Antoniucci D, De Luca L, Biondi-Zoccai GG, Crea F, Zijlstra F [11]	Clinical impact of thrombectomy in acute ST-elevation myocardial infarction: an individual patient-data pooled analysis of 11 trials	82	123	2009
Oldgren J, <b>Budaj A</b> , Granger CB, Khder Y, Roberts J, Siegbahn A, Tijssen JG, Van de Werf F, Wallentin L [12]	Dabigatran vs. placebo in patients with acute coronary syndromes on dual antiplatelet therapy: a randomized, double-blind, phase II trial	69	145	2011
<b>Jankowska EA, Rozentryt P, Witkowska A, Nowak J</b> , Hartmann O, <b>Ponikowska B</b> , <b>Borodulin-Nadzieja L</b> , <b>Banasiak W</b> , <b>Polonski L</b> , Filippatos G, McMurray JJ, Anker SD, <b>Ponikowski P</b> [13]	Iron deficiency: an ominous sign in patients with systolic chronic heart failure	54	77	2010

Surnames of all Polish cardiologists, co-authors of 10 most cited papers in “European Heart Journal” with any Polish affiliations, have been bolded.

\*EHJ Office; \*\*Based on SCOPUS Database, 08.01.2013





**Figure 3.** 80 Polish cardiologists and cardiac surgeons on the ship “Dar Młodości” travelling to the ESC Congress in Amsterdam to express their gratitude to the Netherlands for conducting more than 400 life-saving operations on Polish children with congenital heart disease in 1983–1990

CD34(+)CXCR4(+) cells and non-selected mononuclear cells in patients with acute STEMI and reduced left ventricular ejection fraction: results of randomised, multicenter Myocardial Regeneration by Intracoronary Infusion of Selected Population of Stem Cells in Acute Myocardial Infarction (REGENT) trial”, where Michał Tendera was the first author was cited 148 times [4]. The “Guidelines on the diagnosis and management of acute pulmonary embolism: the Task Force for the diagnosis and management of acute pulmonary embolism of the European Society of Cardiology (ESC)”, where Adam Torbicki was an author was cited 580 times [5]. Further remarkable papers by Polish cardiologists published in the EHJ are listed in Table 3.

### ANNUAL CONGRESS OF THE EUROPEAN SOCIETY OF CARDIOLOGY

The annual congress of ESC has become the largest international forum worldwide with one third of attendees coming from non-ESC countries. Since the first congress, the number of participants has increased impressively and reached its maximum in Paris in 2012 with 32,000 attendees. The largest numbers of delegates came from Germany, France Italy, Japan and USA. The number of Polish delegates averaged around 500. From 2008 to 2013, Polish cardiologists submitted a total of 1,589 abstracts with an acceptance rate of over 30%. Indeed, over 500 abstracts were accepted for oral presentations or as a poster.

Interestingly, more than 80 Polish cardiologists and cardiac surgeons travelled by a ship with the “Dar Młodości” to the ESC Congress in Amsterdam (Fig. 3) to express their gratitude to the Netherlands for conducting more than 400 life-saving operations on Polish children with congenital heart disease in 1983–1990. Through this initiative, Polish

cardiologists, cardiac surgeons, anesthesiologists and nurses were trained. As a consequence, many centres in Poland are now able to manage patients with congenital heart disease, including the prenatal care.

### THE “POLISH HEART JOURNAL” (PHJ)

The “Polish Heart Journal” (PHJ) is the official journal of the PCS. The first issue of the PHJ was published in 1957 under the editorship of Jerzy Jakubowski. Of note, within last 5 decades the quality of the journal grew constantly to become an interesting and valuable forum of key opinion leaders. Currently, the journal publishes original research, reviews, editorials and clinical vignettes available in English being referenced in Medline with a current impact factor of 0.536.

### “CLUB 30” — A FORUM FOR YOUNG CARDIOLOGISTS

Long before the ESC established the “Cardiologists of tomorrow”, Leszek Ceremużyński in 1994 initiated the “Club 30”, as an official unit within the PCS with the intent to bring together the most promising young Polish cardiologists who are internationally recognised despite their young age. Notably, members of “Club 30” are recipients of international awards, including ESC Grants and Fellowships. The Club’s activity includes spring meetings, symposia during PCS congress and even sessions during the annual ESC congress.

### THE FUTURE

The challenges that PCS face over the next half-century are no different to any other European society. During 50<sup>th</sup> Anniversary Congress in 2004, Adam Torbicki, the then President Elect of the PCS, argued that in clinical cardiology efforts should focus on implementing guidelines, on continuing medical education and in the accreditation of cardiovascular laboratories.

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